

CEM500-L

Online Gas Analyser



Specialist Of UV Spectroscopy

> CEM500-L Online Gas Analyser

The **CEM500** is an extractive online gas analyser dedicated to **Continuous Emission Monitoring**

It is specifically dedicated to the new low level emission regulations known as 50/30/5/3 (50 mg/Nm³ NO_x, 30 mg/Nm³ SO₂, 5 mg/Nm³ particles, 5 µg/Nm³ mercury) and also to chemical processes requiring low values of H₂S.

This new model is based on a multi-path flow cell of 1200 mm coupled to a high resolution spectrograph (0.1 nm) using an ultra-sensitive 2048 pixels CCD (Charge-Coupled Device). It gives a high sensitivity and a longer lamp life time (3 years).

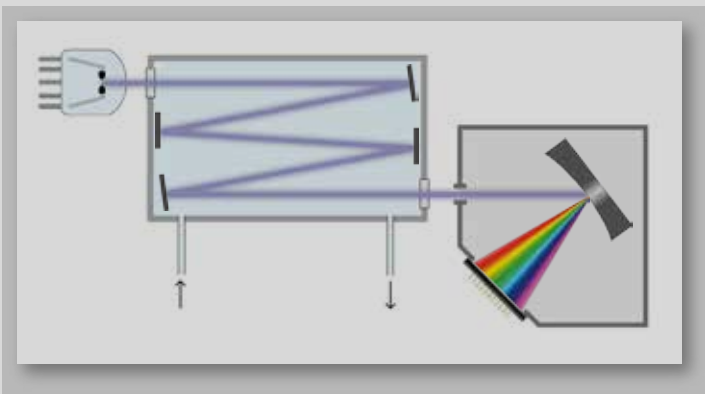
The UV spectroscopy brings a higher sensitivity than infra-red spectroscopy and also gives the possibility to measure several gases simultaneously on the same spectrograph.

A high selectivity is achieved by doing a fast Fourier transform (FFT) on the absorbance spectrum for the gases with periodic structure like NH₃, SO₂, CS₂ and others.

The internal gas circuit, including the optional sampling pump, is heated at 240 °C to admit directly hot and humid combustion gases and also to avoid the deposits along the tubing and windows.



- Several gases can be measured simultaneously thanks to the UV spectroscopy method by using different wavelengths and algorithms. For gases with a periodic absorption spectrum such as NH₃, SO₂, NO, CS₂ or acetylene, an algorithm based on FFT (Fast Fourier Transform) guarantees a very good selectivity of measurement. The solid-state design due to the UV spectroscopy gives a high reliability of the measuring system with quite no maintenance.
- The UV lamp is a xenon flash lamp with a high lifetime and without thermal effect that may generate measurement drift.
- The gas flow cell has two quartz windows to transmit the UV light through the measured gas. The standard path length of the flow cell is 1200 mm.
- The spectrograph is based on a concave grating to minimize the optical parts and the spectrum is read on a 2048 pixel CCD with a resolution of 0.1nm.
- A zero is done automatically on zero air or nitrogen with an adjustable period (if possible every 2 or 4 hours but once per day remains acceptable).
- The absorbance spectrum is calculated from the reference spectrum acquired during the zero step.



The measuring principle is based on the UV light absorption according to the Beer-Lambert Law:

$$[C] = K \log \frac{I_{ref}}{I_{gas}}$$

[C] : Concentration of the sample
 K : Absorption coefficient at a specific wavelength for a specific gas
 I_{ref} : Light intensity on the zero air
 I_{gas} : Light intensity on the sample

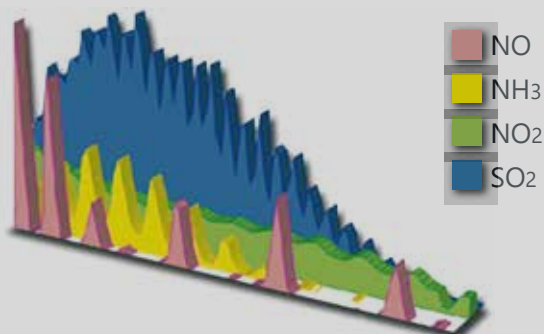
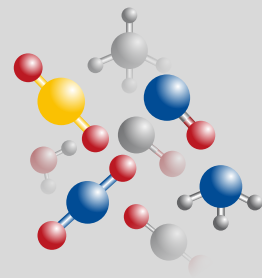
Heated Version

The analyser is provided with a heating system for the gas circuit. The heating temperature can be adjusted up to 240°C. The high temperature evaporates any deposits on the windows.

No Interference with CO, CO₂ and CH₄

The major emission gases like CO, CO₂, and CH₄ have no UV absorption, therefore they don't interfere with the measured gases.

H₂O has a weak absorption in the UV range but at different wavelengths than combustion gases like NH₃, NO, NO₂ or SO₂. Consequently, H₂O, with an usual concentration between 5% and 20%, is not disturbing the measurements.



Several gases can be measured in a same analyser if the sample gas composition is compatible with the selected algorithms and wavelengths.

The analyser gives high measurement selectivity thanks to the recognition of the specific UV absorption spectrum of gases by using proprietary algorithms.

The design has been specially oriented for low maintenance and high reliability on the measurements.

The UV xenon lamp is specified for a lifetime of 10^9 flashes. Therefore, the lifetime is about 3 year with continuous measurements or 10 years with one measurement per minute. This reduces considerably the maintenance and the risk of wrong measurement due to aged lamps or its replacement.

User-Friendly Interface

A colour touch screen display interface allows the user to easily navigate through a number of screens that are used to set and check all of the operating conditions of the instrument.

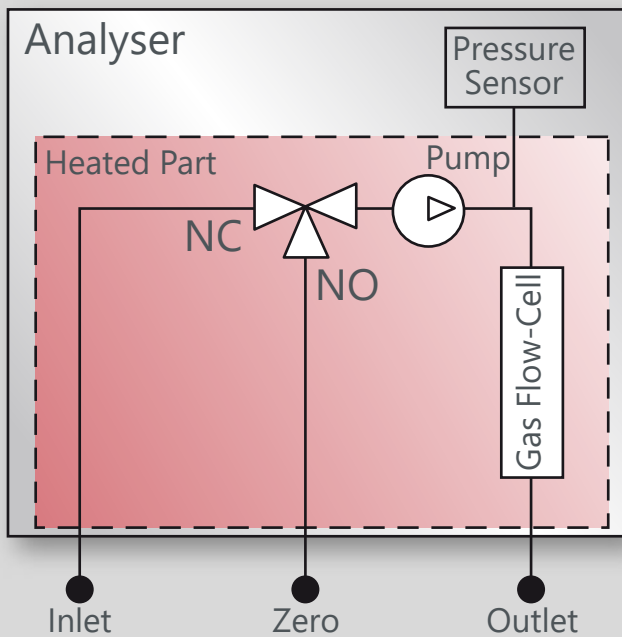
A protective film limits the risk to damage the surface of the touch screen, especially against solvent and corrosive liquid.



Gas Circuit

Three gas connections are available on the rear panel of the analyser :

- Inlet for the sample -
- Zero air or nitrogen -
- Outlet for sample or zero -



Inlet and zero are connected on a 3 ways electric valve. When the automatic zero is activated, the solenoid valve switches the flow cell on zero air. A pressure sensor takes the pressure of measured gas to compensate it and to give a flow indication.

All the gas circuit is in a heated compartment controlled within ± 0.5 °C at an adjustable temperature between 40°C and 240°C.

An optional pump may be included before the gas flow cell in order to pump the sample as well as the zero gas that may be ambient air for most of the applications.

Automatic Compensation

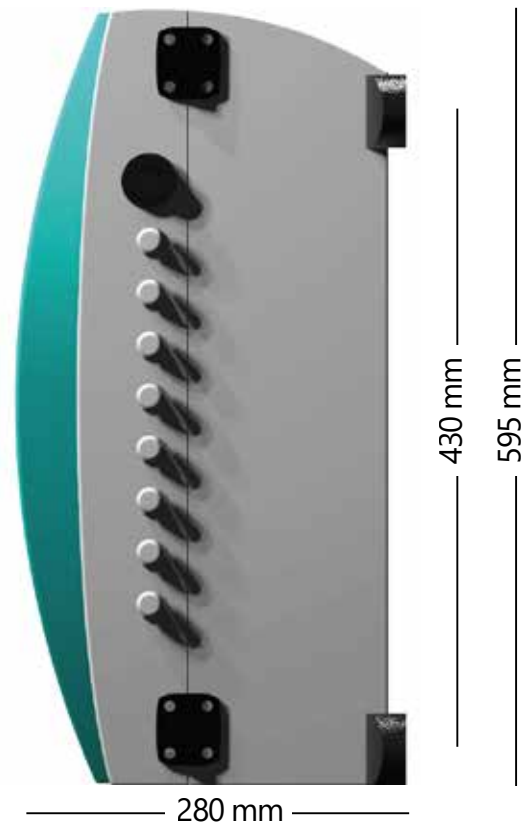
An internal measurement of temperature and pressure of the sample is performed. A ratio related to the ideal gas law is applied on the measured value to compensate the effects of temperature and pressure.

Recorded data and diagnostic files for each parameter can be downloaded to memory stick thanks to a USB port.

This allows to collect easily these files on site without using a computer. The files are in text format and can be directly imported to Excel® for graphic charts.



> CEM500-L Parameters Specifications



Parameter	Range* (ppm)	Range* (mg/m ³)	Typical Repeatability	Detection Limit <small>Typical Detection limit as 3x sigma on zero gas, 60 sec response time at 90%.</small>
NH ₃ Ammonia	0-10 ppm	0 - 7 mg/m ³	0.1 ppm at 10 ppm	0.01 ppm
NO Nitrogen Oxide	0-80 ppm	0 - 100 mg/m ³	0.2 ppm at 40 ppm	0.5 ppm
SO ₂ Sulfur Dioxide	0-30 ppm	0 - 100 mg/m ³	0.2 ppm at 30 ppm	0.05 ppm
H ₂ S Hydrogen Sulfide	0-100 ppm	0 - 150 mg/m ³	0.1 ppm at 20 ppm	0.1 ppm
NO ₂ Nitrogen Dioxide	0-200 ppm	0 - 400 mg/m ³		2 ppm
CS ₂ Carbon Disulfide	0-20 ppm	0 - 60 mg/m ³		
C ₆ H ₆ Benzene	0-20 ppm	0 - 60 mg/m ³		
C ₇ H ₈ Toluene	0-5 ppm	0 - 20 mg/m ³		
C ₈ H ₁₀ Xylene	0-5 ppm	0 - 1000 mg/m ³		
NCL ₃ Nitrogen Trichloride	0-20 ppm	0 - 100 mg/m ³		

*Higher range available on request

> CEM500-L General Specifications

Data storage	5000 measurements for all parameters
Interfaces	Interface RS232 (MODBUS, AK) USB port (for memory stick) Internal WIFI interface IEEE 802.11 B (OPTION) Internal Ethernet 10 BASE-T interface IEEE 802.3 (option)
Signals	1 to 8 analog outputs 4-20 mA opto-isolated (option) 1 to 4 relay contacts programmable (option)
Display	LCD colour screen (TFT) with LED backlight 640x480 pixels
Power supply	110-240 VAC / 1000 VA / 50-60Hz
Operatings limits	0 to 40 °C, less than 90% as relative humidity
CE standards	Electromagnetic compatibility and safety EN 61010-1, IEC 61010-1 / EN 61326, IEC 61326
Enclosure	Stainless steel IP65 with coating
Dimensions	345 x 595 x 280 mm
Weight	33 kg
Sampling gas	Pressure : 0 – 2 bar absolute (0 – 2000 hPa absolute) Flow : 0.1 to 10 L/min Temperature : ambient to 400 C Fittings : Swagelok, stainless steel 316 for tube OD ¼" (6.4 mm)
Zero gas	Pressure : 0 – 2 bar absolute (0 – 2000 hPa absolute) Flow : 0.1 to 10 L/min Fittings : Swagelok, stainless steel 316 for tube OD ¼" (6.4 mm)

> CEM500-L Parts references

Basic unit

CEM500-L **Basic unit (one gas included)**

Recommended flow for sample and zero air: 0.5 to 10 litres/min
 Fittings: Swagelok stainless steel 316 for tube OD ¼" (6.35 mm)
 Color graphic display 640x480 pixels with touch screen
 Built-in data logger, memory 5000 measurements
 12 sockets for input and output modules (not included, refer to options)
 RS232 included (Sub-D 9 ways female connector) with 2 meters cable for PC
 RS485 included for communication with MODBUS protocol
 USB Port for USB key (measurements and configuration download, software update)
 Power supply 110-240 VAC 47-63 Hz 1000 VA with power cord 2 meters
 Enclosure IP65/Nema4x stainless steel 316 (595x345x280 mm, 33 kg)
 Mounting lugs for wall
 Sampling pump not included
 Heated version at 240 °C (adjustable)
 For use on wet combustion gas

Internal pump

PUMP500 **Internal membrane pump with heated head**

Built-in inside the enclosure
 Flow about 6 l/min
 Heated version at 240 °C

Auto calibration

AUTOCALG500 **Auto-calibration for one gas**

For wall mounting outside the enclosure

Additional gases (The measurement range is given for an optical path of 1200 mm)

Additional gas

4-20 mA isolated output included

NH3 **Ammonia**
 Range: 0 – 10 ppm NH3 (or 0 – 7 mg/Nm3 NH3)
 Measurement possible until 100 ppm NH3 (or 700 mg/Nm3 NH3)

H2S **Hydrogen sulphide**
 Range: 0 – 100 ppm H2S (or 0 – 150 mg/Nm3 H2S)
 Measurement possible until 200 ppm H2S (or 0 – 300 mg/Nm3 H2S)

NO **Nitric oxide**
 Range: 0 – 80 ppm NO (or 0 – 100 mg/Nm3 NO)
 Measurement possible until 500 ppm NO (or 600 mg/Nm3 NO)

NO2 **Nitrogen dioxide**
 Range: 0 – 200 ppm NO2 (or 0 – 400 mg/Nm3 NO2)
 Measurement possible until 500 ppm NO2 (or 1000 mg/Nm3 NO2)

SO2 **Sulfur dioxide**
 Range: 0 – 30 ppm SO2 (or 0 – 100 mg/Nm3 SO2)
 Measurement possible until 1000 ppm SO2 (or 300 mg/Nm3 SO2)

C6H6 **Benzene**
 Range: 0 – 20 ppm C6H6 (or 0 – 60 mg/Nm3 C6H6)
 Measurement possible until 50 ppm C6H6 (or 150 mg/Nm3 C6H6)

C7H8 **Toluene**
 Range: 0 – 5 ppm C7H8 (or 0 – 15 mg/Nm3 C7H8)
 Measurement possible until 10 ppm C7H8 (or 30 mg/Nm3 C7H8)

C8H10 **Xylene**
 Range: 0 – 5 ppm C8H10 (or 0 – 20 mg/Nm3 C8H10)
 Measurement possible until 10 ppm C8H10 (or 40 mg/Nm3 C8H10)

CS2 **Carbone disulfide**
 Range: 0 – 20 ppm CS2 (or 0 – 60 mg/Nm3 CS2)
 Measurement possible until 50 ppm CS2 (or 150 mg/Nm3 CS2)

C2H2 **Acetylene**
 Range: 0 – 1000 ppm C2H2 (or 0 – 1000 mg/Nm3 C2H2)
 Measurement possible until 2000 ppm C2H2 (or 2000 mg/Nm3 C2H2)

> CEM500-L Parts references

Input modules

- IN4-20** **4-20 mA input module**
Isolated 4-20 mA input
Impedance: 100 Ohm
- LOGIC500** **Double logical inputs module**
Input no 1 : external pulse command for measurement
Input no 2 : measurements inhibition
Isolated 0 – 24 V DC inputs
Impedance: >10 Kohm

Output modules

- OUT4-20-500** **4-20 mA output module**
Isolated 4-20 mA output
Active output, Max load 500 Ohm
- RELAY500** **Relay module**
Contact rating: 2A/220V

Communications

- WIFI500** **Wifi Interface**
Connection to wireless WIFI network
Standard IEEE 802.11b
Secured data transfer by WEP keys
- ETHER500** **Ethernet interface**
Ethernet 10 base-T (IEEE 802.3)

Recommended consumables for 2 years :

- L-XEN-1**: xenon lamp with trigger (x1)
MKIT-SPL- G-1: Pump kit with membrane (x2) only if sampling pump

The manufacturer reserves the right to modify and/or change any specifications, dimensions, design or drawing at any time without prior notice

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Management System
ISO 9001:2008

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